

Association of resin infiltration and composite resin on the treatment of severe dental fluorosis.

Prof. Dr. Leandro Augusto Hilgert, Marília Bizinoto Silva Duarte



Fig.1: Base status.

Enamel developmental defects may negatively affect esthetics and patients' self-esteem [1]. This is particularly true for young patients. For these cases, treatments should be able to present an acceptable esthetic result without compromising much tooth structure (being minimally invasive). Resin infiltration has been shown to be a microinvasive treatment for white spot lesions, slight to moderate fluorosis and some other types of opacities [2, 3]. However, in more severe cases, in which tooth substance loss is already present and/or opacities are too opaque and deep, a combination of resin infiltration and composite resins may be an effective, fast and minimally invasive approach to improve esthetics («deep infiltration») [4]. Fluorosis is characterized by hypomineralization of the enamel [5]. In less severe cases the subsurface hypomineralized enamel may be resin infiltrated only in a true microinvasive treatment approach. The aim of this case report is to present a severe case of fluorosis in which due to enamel loss and deep opacities an association of resin infiltration and composite resin restorations was used on the treatment a young patient.

Case report

A young female patient presenting a severe case of fluorosis reached the University clinic seeking for esthetic treatment. During anamnesis it was revealed that the child was shy and afraid of smiling, and episodes of bullying at school have already happened due to the enamel development defects. However, there was a concern by the child and her mother on the possible complexity, costs and invasiveness of the necessary treatment approach. Intra oral examination showed a fluorosis graded as TF6, presenting regions of white opacities as well as some enamel pitting with substantial amount of enamel loss. Transillumination suggested areas of deeper hypomineralization (where light transmittance was blocked) as well as some areas with more shallow lesions. Proposed treatment plan was resin infiltration and small additions of composite resin. Patient and mother were explained on the treatment steps and the possible need for some localized wear of the enamel on the regions that already presented enamel pitting and discoloration and on the areas with deeper opacities.



Fig. 2



Fig. 3

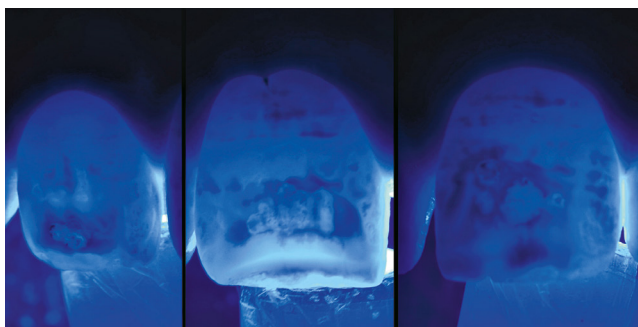


Fig. 4

Fig. 1-4: Figures 1, 2 and 3 present different views of the clinical case in which the patient presents fluorosis (TF6). Observe that there are areas with diffuse and slight white opacities, areas with very opaque white opacities and areas that already present enamel loss and some discoloration. In Figure 4 transillumination was performed to check light transmittance through the enamel, that may be a useful diagnostic tool since the deeper the enamel hypomineralization, the more light is blocked. Some areas of the affected anterior teeth area were suggested to present deeper lesions, that may impair a more complete resin infiltration without some previous wear of the enamel.



Fig. 5



Fig. 6



Fig. 7



Fig. 8

Fig. 5-8: After isolation of the operative field using lip retractors and a liquid dam to protect soft tissues (Fig. 5), Icon-Etch (hydrochloric acid) was applied on the surfaces for 2 mins (Fig. 6) aiming to remove the enamel surface layer and create access to the subsurface hypomineralized enamel (porous area). In Figure 7 it is possible to observe the matt appearance after the acid etching. In Figure 8, a drop of Icon-Dry (alcohol) was applied on the etched surfaces. After a few seconds, it is possible to see that some areas around the enamel pitting kept very white and opaque. This »optical test« after etching may be useful to indicate areas in which a more pronounced enamel wear is needed to create access to the hypomineralized layer. This extra step may be performed with repeated acid etchings or, in deeper lesions, with air abrasion or rotary instruments.



↗ Fig. 9



↗ Fig. 10



↗ Fig. 11



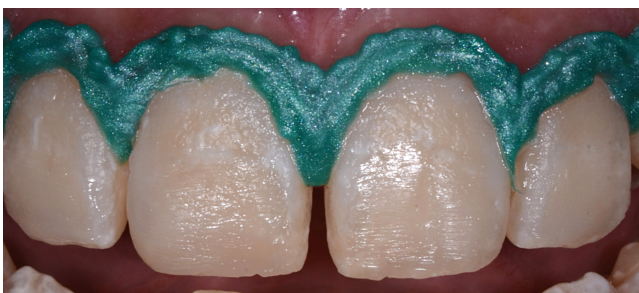
↗ Fig. 12



↗ Fig. 13



↗ Fig. 14



↗ Fig. 15



↗ Fig. 16

↗ **Fig. 9-12:** In this case we opted for diamond burs to wear the surface. Localized preparations were performed, removing the superficial part of the more affected enamel and areas of discoloration (where enamel pitting was already present) (Fig. 9). Then, Icon-Etch was applied once more for 2 mins (Fig. 10). Figure 11 shows the aspect after localized enamel wear and acid etching. It possible to see that there are still whitish areas that could be infiltrated. After etching Icon-Dry was dropped onto the surfaces (Fig. 12). Observe the more uniform aspect after alcohol application, indicating that a better access to the porous areas was achieved. Once the result was good, Icon-Dry was left for 30s and surfaces thoroughly dried.

↗ **Fig. 13-16:** Icon-Infiltrant (the low-viscosity resinous infiltrant) was applied according to manufacturer's instructions (3 min, excess removal, light-curing; 1 min, excess removal, light-curing) (Fig. 13). In Figure 14 it is possible to see the aspect immediately after infiltration in which a uniform color was achieved and most of the whitish opacities were adequately masked. This uniform substrate eases composite resin stratification and improves final result since there is no need for masking white spots with opaque composites. Areas of worn enamel and previous enamel pitting where restored using only body and enamel shades (Fig. 15). It is interesting to say that after resin infiltration, if the surface was not contaminated, it is not necessary to apply an adhesive. Methacrylate-based composites effectively adhere to the infiltrant [6]. Figure 16 shows that tooth anatomy was correctly recovered. After composite resin application a careful finishing and polishing procedure was performed on the infiltrated and restored surfaces using abrasive disks, rubber cups and polishing pastes.



Fig. 18



Fig. 17

Fig. 17-18: Figures 17 and 18 show the immediate results achieved after association of resin infiltration and composite resin. Esthetics were significantly improved. Patient and mother were very satisfied. Even though some enamel wear was needed, we considered this a simple, cost-effective, fast, and minimally invasive approach to deal with the clinical situation. Compare post-treatment pictures with Figures 1 to 3.

The presented treatment shows that an association of resin infiltration and composite resin may be an interesting approach to severe cases of fluorosis or other enamel defects that are nonresponsive to resin infiltration only. The localized wear performed with abrasive instruments removes the highly affected enamel and exposes the underlying porosities that are, then, able to be adequately infiltrated (technique known as »deep infiltration«). The advantage of infiltrating the (still porous) subsurface enamel before covering it with composites is that a uniform substrate is achieved, avoiding the need to use opaque dentin shades, that in thin thicknesses either do not mask the whitish underlying enamel or do not present the expected life-like esthetics and translucency of the enamel. Learning from cases like this on limitations of using resin infiltration alone, but its usefulness when associated with localized preparations and composite resin restorations allow the dentist to have new treatment possibilities that aim on a highly esthetic outcome with a minimally invasive approach.

Key Learnings

- Severe fluorosis or other very opaque (deep) enamel defects might require a previous enamel wear to allow underlying hypomineralized enamel to be adequately infiltrated;
- »Deep infiltration« promotes a uniform substrate that eases obtaining nice esthetic results with thin (and conservative) increments of body and enamel shades of composite resins;
- Bonding to composites after resin infiltration does not require an additional adhesive step. If after the infiltrant final light-curing there is no contamination of the operatory field, composite increments may be directly applied onto the infiltrated surfaces.

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Fluorosis infiltration – Case study of a young patient.

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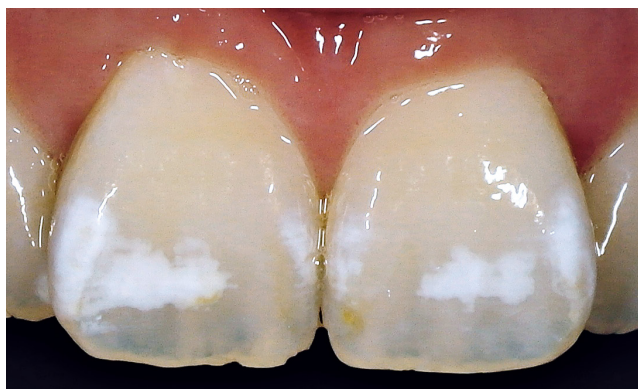


Fig. 1: Frontal view of the white spots 11, 21.

As part of a routine examination our patient reported an increasing urge to do something about the white spots on her anterior teeth (Fig. 1). After weighing various therapy options, it was jointly decided that infiltration was the treatment of choice [1].

In numerous studies there is evidence of almost optimal matching of infiltrated (orthodontic) white spot lesions to the shade of the natural tooth enamel [2, 3, 4, 5].

In terms of the localization, form, and patient's history, the white spots on the labial surfaces of teeth 11 and 21 are classified as fluorosis with severity 0.5 (community fluorosis index according to Dean). Masking of the white spots using infiltration is based solely on altering the refractive index near the whitish opacities. Healthy enamel has a refractive index (RI) of 1.62. The different refractive index at the margins causes light to scatter which gives the lesion a whitish appearance [6]. Regardless of whether the porosities are caused by incipient caries or a mild fluorosis, in the initial stage they appear as whitish staining to the human eye due to the lower refractive index. Infiltration of this area will change the refractive index and mask the opacities. Most of the data on infiltration in the labial surfaces of the anterior teeth are from patients following orthodontic multiband treatment. The resultant white spots can be very easily and permanently eliminated using infiltration [7, 8].

The success of the infiltration is highly dependent on the level of fluorosis damage. With very mild to moderate fluorosis, the infiltration technique has been successfully used in vitro as an intervention for fluorosis [9]. Nevertheless we decided to use infiltration because it is the least invasive treatment option in this case. If the infiltration was not successful, it would not prevent a



Fig. 2: Firstly, the teeth should be cleaned or (as in our case) a professional dental cleaning should be done. A protection of the mucous membranes using a dental dam is performed.

more invasive treatment method. A combination of the infiltration with composite treatment is definitely possible. This is because even with simultaneous composite treatment of enamel surfaces affected by caries no additional adhesive is required for the enamel. Only once dentin is involved, appropriate adhesives have to be used [10]. Therefore, there is nothing preventing an invasive composite treatment subsequent to successful infiltration (successful from an esthetic perspective). What is noteworthy is that the infiltrated teeth can be bleached with standard methods. The results are comparable with the effects that can be achieved with non-infiltrated teeth. This means that unwanted shade changes in the form of uneven shading of the teeth are of no concern [11, 12].

Key Learnings

- Icon-Infiltrant can penetrate into porosities in fluorosis white spots and thereby minimizes the difference of refractive index between the health enamel and fluorosis white spots.
- The number of etch times will be decided according to the assessing in Icon-Dry step. When the expected result is not achieved, the white spot need to be etched and dried again before infiltration step.
- Icon infiltration is a promising and micro invasive treatment for the patient impaired by fluorosis white spots.



Fig. 3



Fig. 4



Fig. 5



Fig. 6: Results immediately after treatment.

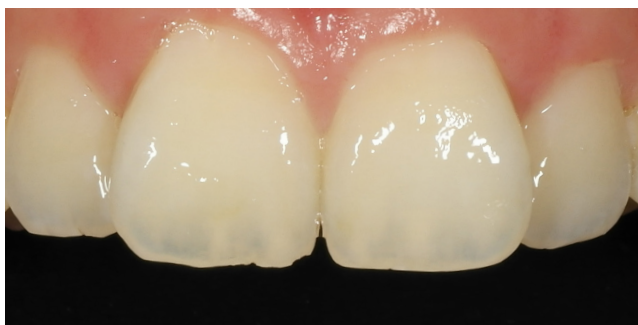


Fig. 7: The appearance after three months.

Fig. 3: After application of a dental dam, the entire labial surfaces were etched for two minutes with Icon-Etch. The procedure was repeated because the initial result was not satisfactory. During the drying with alcohol, there is a preview of the color change. The result was unsatisfactory, which in this case led to three times etching.

Fig. 4: After each etching procedure, Icon-Dry was used for drying after thoroughly spraying the acid off.

Fig. 5: The Icon-Infiltrant was then applied and left on for three minutes, the excess was removed, and this was followed by light curing. This procedure was repeated with the option of shortening the application time (one minute).

Fig. 6-7: After polishing, the treatment was complete and the patient was impressed by the final result.

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Resin Infiltration showing immediate esthetic improvement in non-pitted fluorosis.

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Fig. 1



Fig. 2

Dental fluorosis is caused by ingestion of excess amounts of fluoride, mainly through water, and leads to esthetic alterations of teeth. Fluorosis is prevalent in countries which lack moderated community water supplies and people usually drink ground water having fluoride more than the stipulated limit of 1 ppm.

Dental manifestation of fluorosis may vary from non-pitted white opacities/ brown stains covering partial or complete tooth surface (s) to pitted tooth surfaces.

Conventionally dentists have been treating these non-pitted fluorosis lesions by bleaching, micro-abrasion, composite veneering while on the other end laminates/ crowns are frequently given for pitted fluorosis teeth. However recently a novel micro-invasive resin infiltration technique is introduced which has shown promising results for the treatment of demineralized white spot lesions, in terms of, both stopping the progress of these lesions and improving the esthetics [1].

Later the technique was tried by many dentists worldwide for other hypomineralized lesions, including fluorosis, hypomineralized developmental defects, Molar-Incisor hypomineralization cases,

trauma induced mineralization defects etc. [2, 3].

Clinical case

The present clinical case is of a patient who was having chalky white opaque areas covering the whole tooth/ teeth due to fluorosis. It was decided to treat the lesion using micro-invasive resin infiltration procedure, using vestibular Icon kit (DMG, Germany) for which the informed consent was sought from the patient.

The vestibular Icon kit contain three syringes, along with applicator tips for facial surfaces, each to be used in the three step procedure for application of resin infiltration; namely 1. Etching: Icon-Etch which is composed of 15 % Hydrochloric acid, 2. Drying agent: Icon-Dry, composed of Ethanol, 3. Infiltrant: Icon-Infiltrant, composed of Infiltrant having very low viscosity resin allowing it to infiltrate in the body of lesion.

The tooth represented in this clinical case is #12, which was isolated with rubber dam and the white opacity covering the whole tooth is visible in the pre-operative clinical picture (Fig. 1). This was followed by application of Icon-Etch for 2 minutes (Fig. 2).

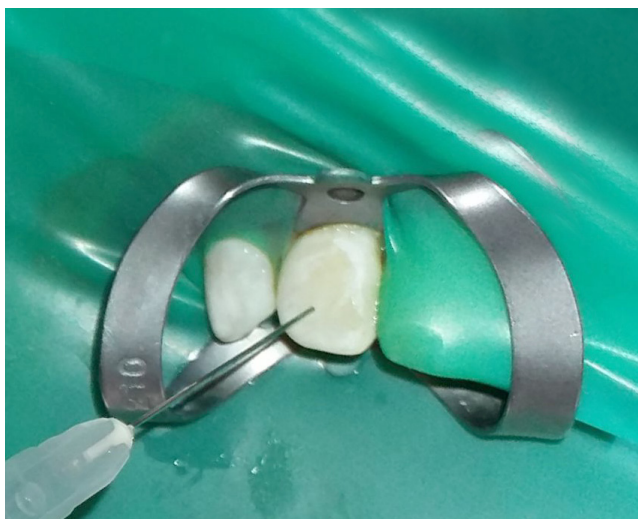


Fig. 3



Fig. 4



Fig. 5



Fig. 6

Icon-Etch was washed off for 30 seconds and tooth was dried with oil free air. Etching was repeated again for 2 more minutes. Next the drying agent (Icon-Dry) was applied for 30 seconds (**Fig. 3**), which then evaporated leaving the accentuated pores making it easy for infiltrant to seep in. Lastly the infiltrant was applied (**Fig. 4**) and was left in place for 3 minutes followed by light curing the infiltrant for 40 seconds (**Fig. 5**) and a repetition of infiltrant application for 1 more minute. Immediate improvement in esthetics and good patient satisfaction was observed (**Fig. 6**).

Key Learnings

- It can be concluded that resin infiltration can be used for non-pitted white opacities which are due to fluorosis.
- In fact literature suggests that resin infiltration can be used for any kind of hypomineralization defects, however variations in the etching times and number of infiltrant applications are required, which depends on the depth of the lesion and should be judged clinically on case to case [4, 5, 6].

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Resin infiltration as a micro invasive treatment for fluorosis.

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Fig. 1

A 26-year old female patient presenting mild to moderate fluorosis looked for esthetic treatment. Her main complaint regarded the whitish diffuse opacities that affected her smile.



Fig. 2

Fluorosis is observed, clinically, from mild diffuse white opacities on the enamel to severe whitish/brownish staining and enamel surface malformation. Those conditions may compromise esthetics according to its severity. For light to moderate fluorosis, the most common cases, there are reports that resin infiltration may successfully mask the opacities improving esthetics with very low enamel wear. The aim of this case report is to present a step by step description of the resin infiltration technique as a microinvasive alternative for the esthetic treatment of fluorosis. Considerations on how to diagnose depth of the opacities and on how many times to etch the enamel to improve results predictability are presented. Main features of the resin infiltration technique and other established esthetic treatments for fluorosis are discussed.

Introduction

Fluorosis is characterized by subsurface enamel hypomineralization (porosities) caused by excessive fluoride intake during enamel development [1, 2]. In mild to moderate cases of fluorosis, the lower refractive index (RI) of the porosities contents gives the enamel a diffuse whitish opaque appearance that, for some patients (according to fluorosis severity), may be aesthetically unpleasant.

Many treatment options are available for fluorosis as: (a) bleaching, that can possibly reduce the contrast between whitish opacities and sound enamel; (b) microabrasion, in which the surface and subsurface of the affected enamel are worn out by a combination of acids and abrasives, exposing the underlying sound enamel; (c) macroabrasion, where a preparation is performed on the affected fluorotic areas followed by a restoration; and, (d) resin infiltration,

a technique that involves a very mild wear of the surface enamel, exposing the porous subsurface that is subsequently infiltrated by a low-viscosity resin that has a RI more similar to sound enamel [3, 4]. Usually, bleaching alone is not capable of providing a complete optical blending of the fluorotic to the sound enamel. Micro and macroabrasion techniques are effective, but require a more invasive approach, removing the whole affected enamel. Resin infiltration appears as a suitable alternative that combines good results with a very low invasiveness.

The aim of this case report is to describe in details the resin infiltration protocol on the esthetic treatment of a mild to moderate fluorosis case.

Case Report

A 26-year old female patient presenting mild to moderate fluorosis looked for esthetic treatment. Her main complaint regarded the whitish diffuse opacities that affected her smile (Fig. 1 and 2).

The patient, a dentist, was questioned on how glad she was with the shade of her teeth and she answered that she would like a more natural, less white appearance. This is a crucial question since after treating mild/moderate fluorosis teeth will become more chromatic and presenting less value. Therefore, patients that enjoy a very white shade should be counseled to bleach before treating the fluorotic lesions.

The patient was very pleased with the esthetic result that was obtained with a microinvasive approach.

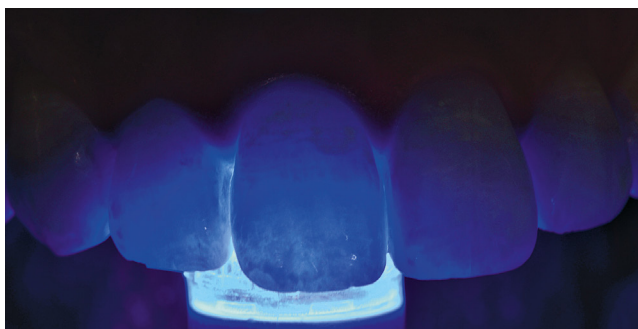


Fig. 3

Fig. 3: To evaluate the depth of the affected enamel a clinically useful tool is to perform transillumination. Specific equipment or even a simple light curing unit can be positioned on the lingual surface and commanded to emit light. When the transmitted light is not or is only slightly blocked by the opacities, the lesions (enamel porosities) are shallow and the probability of less invasive therapies to be effective is higher. In the present case, this was the situation and the fluorotic lesions were judged shallow, indicating a good prognosis for resin infiltration.



Fig. 4

Fig. 4: Next step is isolating the teeth that will be infiltrated. Field isolation and protection of the gingival tissue can be obtained using rubber dam or a liquid light-cured resin dam (Top Dam, FGM, Brazil) together with cheeks, lips and tongue retractors. While the liquid dam is usually faster and easier to apply, rubber dam may present a more intense gingival retraction, that may improve results in the cervical area. In this case, the liquid dam was selected and carefully applied to cover as little enamel as possible.

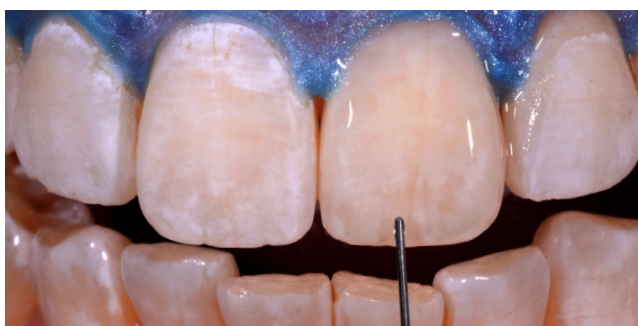


Fig. 5

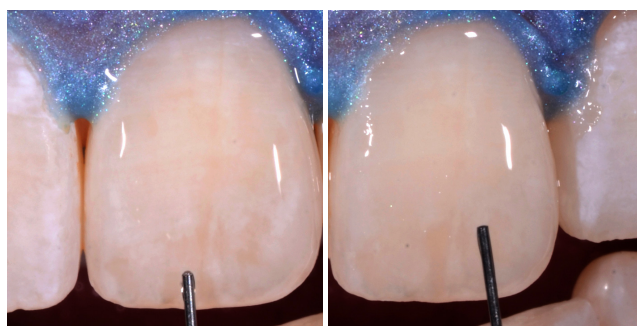


Fig. 6

Fig. 5-6: Resin infiltration protocol begins with etching of the surface enamel using a 15 % hydrochloric acid gel (Icon-Etch, DMG, Germany) that should stay in contact for 2 minutes aiming to wear the surface layer and expose the porous hypomineralized subsurface. After suctioning the acid gel, rinsing and air-drying the enamel a drop of ethanol (Icon-Dry, DMG, Germany) is applied on the etched surface and the observed optical aspect of the white opacities should be already minimized. If the opacities are still very visible when the ethanol is applied, a second (or even a third) etching steps is indicated.

In the present case, in Figure 5, it is possible to observe the aspect after a single etching procedure. Since the opacities were still very visible it was decided to repeat the etching step once more. In Figure 6, it is possible to see the difference between the aspect after one and two etching steps as a drop of Icon-Dry was applied onto the etched enamel surface. Since the result was satisfactory, the ethanol was let on the surface for 30 s to promote a thorough desiccation of the enamel, followed by air-drying.



Fig. 7

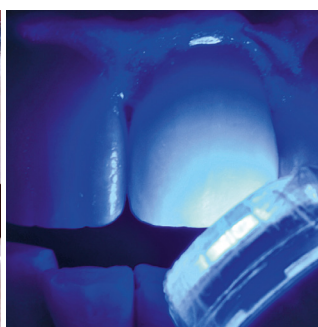


Fig. 8

Fig. 7-8: On the etched and dry enamel the low-viscosity infiltrant (Icon-Infiltrant, DMG, Germany) is applied and should remain for at least 3 minutes to achieve maximal infiltration depth into the porosities of the hypomineralized enamel. In Figure 7 it is possible to observe the aspect after infiltrant application on the right upper teeth, while the left have not received the resin yet. When all teeth received the infiltrant and the 3 minutes waiting period was respected, obvious excess can be removed using a gauze and light-curing is performed (Fig. 8). It is paramount to execute a thorough polymerization using adequate irradiance and exposure time (40 seconds per tooth). A second application of the infiltrant should be performed for 1 minute followed by excess removal and light-curing.



↑ **Fig. 9:** It is possible to see the immediate aspect after infiltrant polymerization. It is normal to observe a shiny and irregular appearance due to excess of the infiltrant covering the surface. These material is easily removed with polishing instruments as abrasive disks, spirals or rubber cups.



↑ **Fig. 10:** In the present case polishing was performed using disks and spirals (Sof-lex, 3M, USA).



↑ **Fig. 11**

After polishing, the result of the treatment is shown on Figure 11 and 12. Almost all white opacities disappeared, indicating a satisfactory infiltration of the fluorotic enamel.



↑ **Fig. 12**

Discussion

An ideal esthetic treatment is the one that can please the demands of the patient, that require very little wear of sound enamel (low biological cost), that can be simply and quickly executed and that lasts.

Patients that present fluorotic enamel may not require any kind of esthetic treatment, especially if presenting a mild severity of the lesions [5]. However, whenever a treatment is required, the dentist should be able to offer treatment options that present efficacy, low invasiveness and durability.

Resin infiltration is a technique based on the acid dissolution of the well-mineralized surface layer of the enamel (with a thickness of around 30-40 μm) [6], exposing the porous hypomineralized enamel of the subsurface. After thorough drying, a low-viscosity resin is infiltrated into the porosities of the enamel by capillary forces filling the spaces with a material that has a closer refractive index to sound enamel. Therefore, the optical appearance of the infiltrated enamel blends with the sound enamel, significantly improving the esthetic harmony of the smile [7-9].

For the infiltration process to be effective the first step is to diagnose the kind of white opacity. Deeper lesions, that are very opaque to transillumination (as in some molar-incisor hypomineralization cases) usually do not present the best results for any kind of less invasive treatment and may require some localized tooth preparation. Shallow to medium depth lesions, as those depicted in the case report, that clinically do not block the light passage during transillumination (see Fig. 3) have usually a favorable prognosis for resin infiltration.

Next, another fundamental step for a successful resin infiltration is adequate removal of the well-mineralized surface layer therefore exposing the porous subsurface. If an adequate access for the resin to infiltrate the porosities is not achieved, the technique will not present the best results. A very effective way of testing if the surface layer was removed after the acid etching step is observing what happens when a drop of ethanol is applied on the etched enamel. If the optical result already looks good, surface layer was properly removed. If the white opacities are still very visible, a new etching step should be performed (see Fig. 6, that depicts the difference between one and two etching steps). An easy and simple method to decide if re-etching is necessary before the drying and infiltration steps.

It is imperative for the dentist to realize that the main difference from resin infiltration to microabrasion is that in the first method the porous enamel is preserved and infiltrated while the later method esthetic success is based on the complete removal of the affected enamel. That is why the technique is indicated for lesions no deeper than 0.2 to 0.3 mm (200 to 300 μm) [10]. Therefore, it is clear that microabrasion is a more invasive alternative, requiring much more enamel wear to present pleasant results.

The color stability of the resin infiltrated enamel has been tested in vitro, (8) in clinical studies [11] and presented in numerous case reports [4, 12-15]. So far results are positive and very promising. This hybrid structure of enamel/infiltrant (the infiltrated enamel) can be successfully daily submitted to the »polishing« of oral hygiene and able to be polished by the dentist in routine clinical sessions.

Based on the substantial amount of available scientific evidence, clinical reports and our clinical experience of almost eight years conducting resin infiltration treatments, this approach has become our standard of care in treating light to moderate fluorosis. Important to state that for many patients that desire to treat the fluorotic opacities and to have whiter teeth, a bleaching procedure is usually performed before resin infiltration [16].

Conclusion

Resin infiltration seems to be a successful microinvasive treatment for the esthetic treatment of light to moderate fluorosis.

Key Learnings

- Resin infiltration is a microinvasive approach for the treatment of slight to moderate fluorosis;
- Additional acid etchings may be necessary to improve resin infiltration. Observing the visual aspect when applying Icon-Dry may be a good way of determining the need for repeating the etching step;
- Removal of Icon-Infiltrant excesses before light-curing and adequate finishing and polishing after light-curing are important steps to promote a nice surface texture.

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Case Report: Masking of fluorosis by resin infiltration.

Prof. Sebastian Paris



Fig. 1: Initial situation

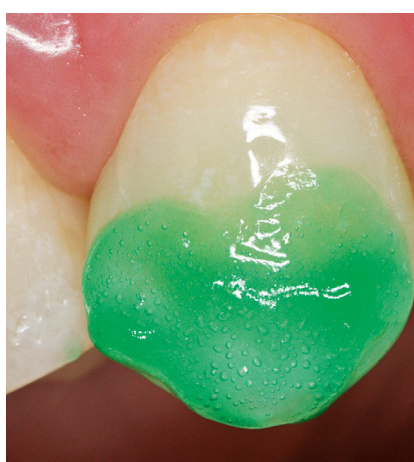


Fig. 2: After cleaning with prophylaxis paste, the affected vestibular area was initially conditioned for 2 minutes with 15% hydrochloric acid gel (Icon-Etch, DMG). At this juncture, the more heavily mineralized surface layer was removed. This shows fewer pores as a result of remineralization processes than the lesion underneath and would thus prevent the infiltrant from penetrating. After 2 minutes, the etching gel was water sprayed off and the lesion carefully dried.



Fig. 3: To achieve further deep drying and at the same time check whether sufficient abrasion of the surface layer was achieved, ethanol (Icon-Dry) was subsequently applied to the lesion. Due to penetration of the ethanol into the lesion's porosities, similar to the later infiltration with resin, the light refraction within the caries was reduced, making the lesion appear less whitish-opaque. When this effect can be observed in the first 2-5 seconds after application of the ethanol, the surface layer is sufficiently abraded to guarantee a quick and complete infiltration.

A 19-year-old patient presented in the university outpatient clinic requesting treatment of whitish spots on her teeth, which she found esthetically disturbing. According to the patient, the spots had already been visible since her adult teeth came through. For this reason, composite fillings had already been placed on the anterior incisors. After a visual-tactile examination, the discolorations were diagnosed as dental fluorosis. Whitish opaque discolorations of the tooth enamel, which are also brownish opaque in severe forms, are characteristic of dental fluorosis cases. These discolorations are mostly located outside the traditional caries predilection sites. The whitish changes often affect several teeth, are poorly defined, are more clearly visible when the teeth are dried and are accentuated on the perikymata. Also characteristic is so-called »snow capping«, a whitish discoloration of the incisal third of the teeth (Fig. 1).

Various therapy options were discussed with the patient, including bleaching, resin infiltration, microabrasion and composite restorations, while the associated necessity for tooth structure removal, the predictability of the esthetic result, the long-term prognosis and the costs were weighed against each other.

The patient opted for resin infiltration due to the relatively low tooth structure removal, good predictability and manageable costs.

For a better estimate of the esthetic result, the most severely affected tooth (13) was treated first. In the present case, there was no isolation with rubber dam because desiccation and protection of the soft tissue could be guaranteed by an adequate distance to the gingiva.



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fig. 8

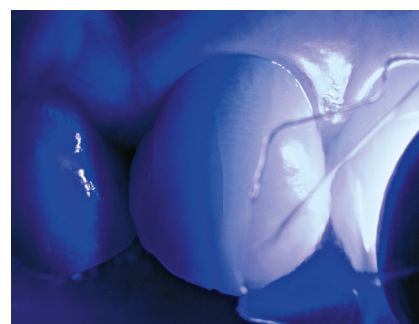


Fig. 9



Fig. 10

Key Learnings

- When Icon-Dry was applied to the lesion, the lesion was masked and appeared less whitish opaque due to the penetration of the ethanol into the lesion's porosities. This effect should be observed in the first 2-5 seconds after application of the ethanol. If this effect comes slower, it most often indicates that the lesion should be etched again.
- Polishing after infiltration treatment is very important to remove the oxygen inhibition layer on the resin.
- When several lesions need to be treated, it will be better to treat one of the lesions first to make sure Icon infiltration treatment works well on this patient and also give the patient more confidence to perform following treatment.

Fig. 4: If the color change is slower, this most often indicates that the surface layer has not been eroded completely. In this case, the lesion should be etched again. In the present case, the lesion was etched again for 2 minutes, the etching gel subsequently sprayed off, the lesion dried with compressed air and ethanol applied once again. **Fig. 5:** At this juncture, an instant (< 2 seconds) disappearance of the lesion's opacity could now be observed, which indicates adequate removal of the surface layer. In preparation for the subsequent infiltration, the ethanol was vaporized with compressed air and the lesion consequently dried thoroughly. **Fig. 6-7:** The infiltrant (Icon-Infiltrant, DMG) was applied in the subsequent step. It could also be observed here how the resin penetrated the lesion and adapted its color to the surrounding tooth enamel. **Fig. 8:** Even though the lesion was fully masked after a few seconds, the excess resin was only removed from the lesion surface with a foam pellet after 3 minutes. **Fig. 9:** The resin then underwent light-curing for 40 seconds. To compensate for the infiltrant's polymerization shrinkage, the resin was applied again and cured again after 1 minute (no illustration). Thanks to the oxygen inhibition of the polymerization of the resin surface layers, a thin raw unpolymerized resin layer remains on the enamel surface. This should be removed by polishing. In the current case, polishing was carried out with polishing disks (Sof-Lex, 3M Espe). **Fig. 10:** The final result on tooth 13 was very satisfactory immediately after the treatment. The remaining teeth (12-23) were thus subsequently treated as described above and showed complete masking of the fluorosis immediately after treatment.

Minimally invasive aesthetic restoration for severe dental fluorosis – combination resin infiltrating with at-home bleaching.

Dr. Ryan Li



Fig. 1: Before treatment. The full dentition was mottled and defected. We chose at-home bleaching first to improve the color of the teeth.

Dental fluorosis is an extremely common disorder, characterized by hypomineralization of tooth enamel caused by ingestion of excessive fluoride during enamel formation.

It appears as a range of visual changes in enamel causing degrees of intrinsic tooth discoloration, and, in some cases, physical damage to the teeth. The severity of the condition is dependent on the dose, duration, and age of the individual during the exposure. The »very mild« (and most common) form of fluorosis, is characterized by small, opaque, »paper« white areas scattered irregularly over the tooth, covering less than 25 % of the tooth surface. In the »mild« form of the disease, these mottled patches can involve up to half of the surface area of the teeth. When fluorosis is moderate, all of the surfaces of the teeth are mottled and teeth may be ground down and brown stains frequently »disfigure« the teeth. Severe fluorosis is characterized by brown discoloration and discrete or confluent pitting; brown stains are widespread and teeth often present a corroded-looking appearance.

People with fluorosis are relatively resistant to dental caries (tooth

decay caused by bacteria), although they may be of cosmetic concern. In moderate to severe fluorosis, teeth are physically damaged.

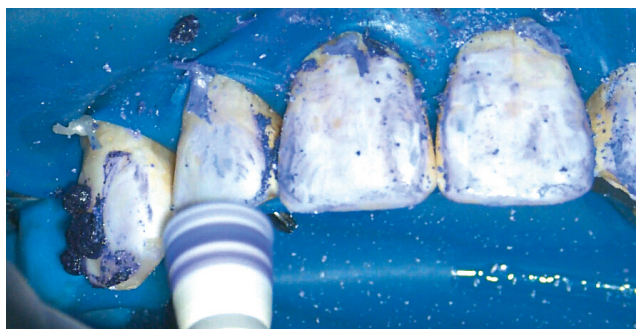
Traditional treatment options for dental fluorosis are porcelain laminate veneer or all-ceramic crowns, which are invasive and expensive. These treatments need normally long clinical procedure (several appointments). Combination resin infiltrating technology with at-home bleaching is a minimally invasive method for treating dental fluorosis and easy to operate. Therefore it is more acceptable for patients.

Clinical case

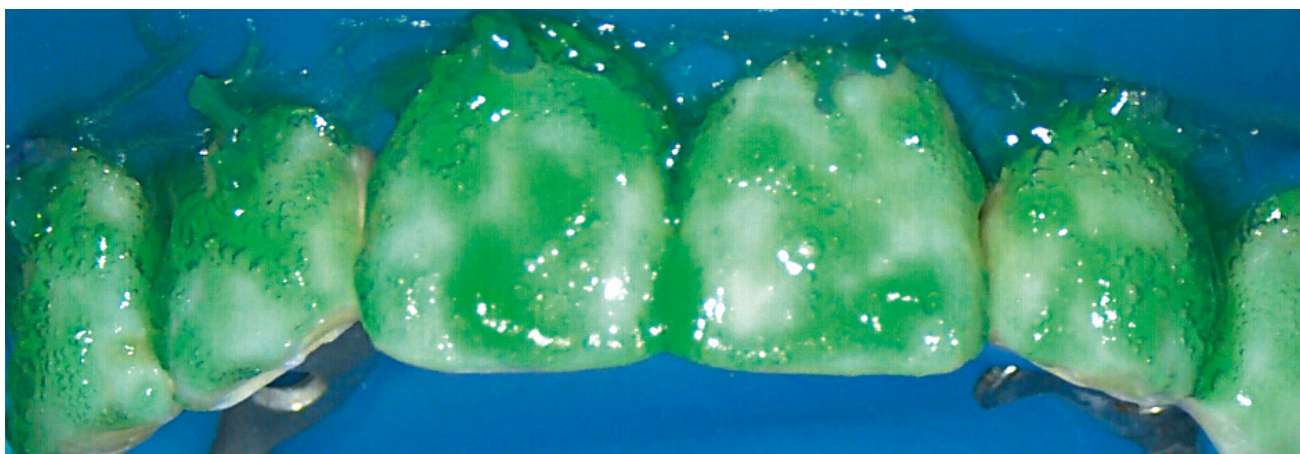
A 23-year-old female patient complained about severe discoloration and discrete pitting on anterior teeth and hoped to improve tooth appearance. After clinical examination, severe dental fluorosis was diagnosed. We offered a treatment protocol – minimally invasive aesthetic restoration combining resin infiltrating with at-home bleaching.



➤ **Fig. 2:** After the comprehensive clinical examination the colorimetric analysis was done and the color of the teeth was recorded. We made individual bleaching tray for the patient and gave the instructions of at-home bleaching and oral health instruction. After using eight units of Opalescence PF 10 % for four weeks, the color of teeth improved dramatically. We began the Icon resin infiltration treatment.



➤ **Fig. 3:** The use of rubber dam is essential when Icon is applied. After cleaning the teeth, rubber dam was performed to isolate the operative site from the rest of the mouth. Tooth cervix was tied off with dental floss. Applied Opalustre grinding paste, which is 6.6 % hydrochloric acid slurry that contains silicon carbide microparticles, on the tooth surface. Polish for 60 s with low speed dental handpiece and rubber cup under the middle pressure. Rinse the grinding paste and evaluate the effect.



➤ **Fig. 4:** Icon-Etch was applied for 2 minutes and sprayed with water and air for 30 seconds. Dry with oil-free and water-free air.



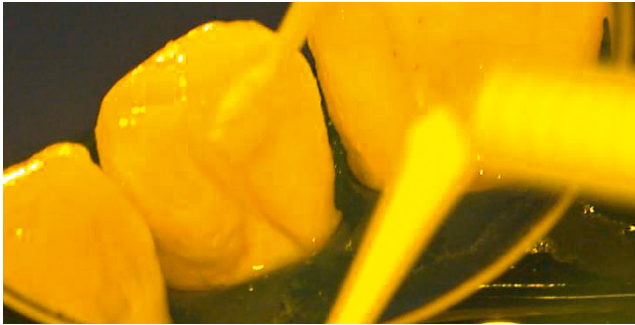
➤ **Fig. 5:** Screw the application tip onto the Icon-Dry syringe, apply an ample amount of material onto the lesion, and allow to set for 30 s. In this step a preview of the final result is shown. When wetted with Icon-Dry, the whitish-opaque coloration on the etched enamel should diminish. The result of the visual check after the first etching showed that the second etching is necessary.



↗ Fig. 6



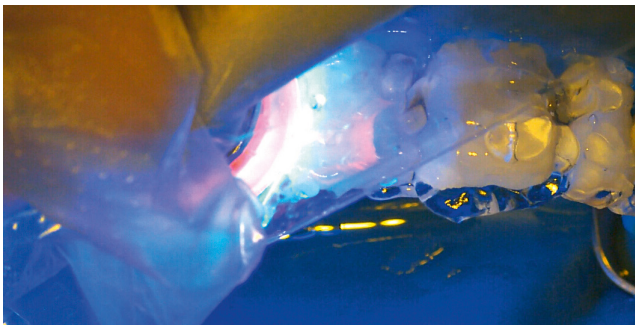
↗ Fig. 7



↗ Fig. 8

↗ **Fig. 6 and 7:** After the second application of Icon-Etch and Icon-Dry, the result of visual check was satisfied. After drying the enamel surface, apply an ample amount of Icon-Infiltrant onto the etched surface under safe light source. Allow Icon-Infiltrant to set for 3 minutes. The Infiltrant will be activated by slightly moving the applicator. Remove excess material with dental floss. Light-cure palatal side firstly, then labial side.

↗ **Fig. 8:** Use ENA HRi esthetic restorative system (UD3+UE3) to fill enamel defects.



↗ Fig. 9

↗ **Fig. 9:** Screw a new Smooth Surface-Tip onto the Icon-Infiltrant syringe, repeat the application, and allow to set for 1 minute. Remove excess material with a cotton wad and dental floss. Apply Antioxidant and light-cure palatal side firstly, then labial side.



↗ **Fig. 10:** Polish the teeth surface with wool polishing wheel and ENA SHINY A,B,C paste.



↗ **Fig. 11:** Immediately after the removal of the rubber dam the esthetic of the upper anterior teeth are visible. The mandibular anterior teeth get the effective result with the same steps. Immediate postoperative esthetics.



➤ Fig. 12: Frontal view of the confident smile on her face!

Discussion

The clinical manifestation of dental fluorosis is that dental enamel developed in the same period has chalk spots or brown spots. Severe dental fluorosis can accompany discoloration with defects.

Discoloration can be treated with dental bleaching. Dental bleaching utilizes hydrogen peroxide or carbamide peroxide which can diffuse into the tooth and dissociate to produce unstable free radicals. Free radicals will attack organic pigmented molecules in the spaces between the inorganic salts in tooth enamel by attacking double bonds of chromophore molecules within tooth tissues [1, 2, 3]. The change in double-bond conjugation results in smaller, less heavily pigmented constituents, and there will be a shift in the absorption spectrum of chromophore molecules; thus, bleaching of tooth tissues occurs.

Enamel micro-abrasion works with the abrasive paste which is 6.6 % hydrochloric acid slurry that contains silicon carbide microparticles. Chemical corrosion and mechanical abrasion happen simultaneously in order to remove enamel defect and make enamel smooth and glossy. Compared with the invasive methods like porcelain laminate veneer and all-ceramic crown, enamel micro-abrasion can preserve more natural dental structure.

Resin infiltration technique is an alternative therapeutic approach, the principle of which is capillary siphoning, to prevent further progression of enamel lesions. This treatment aims to occlude the micro-porosities within the lesion body by infiltration with low-viscosity light-curing resins that have been optimized for rapid penetration into the porous enamel. Because the infiltrating resin's refractive index is closer to the natural enamel, it changes the lower refractive index of decalcified enamel, and makes the teeth bright. Therefore this treatment may be used not only to arrest enamel lesions but also to improve the esthetic appearance of anterior teeth.

Conclusion

Resin infiltrating combined with at-home bleaching and micro-abrasion can treat dental fluorosis effectively. Besides, it leads to minimal invasion on the dental hard tissue and is easy to apply. It can also save time and money for patient. In short, the infiltration technique is the first option for dental fluorosis patient.

Key Learnings

- The patient who suffers from severe fluorosis can be treated by Icon infiltration treatment effectively. It is normally combined with some of other treatments, for example: bleaching, microabrasion, composite restoration.
- Icon infiltration cannot eliminate the yellow or brown stain, therefore normally bleaching is necessary to be performed by the patient with severe fluorosis before infiltration treatment.
- Icon can provide a uniform background for the esthetic composite restoration.

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A noninvasive approach to treating white enamel lesions.

Dr. Alexander Aresdahl

Whether a patient has brown spots, white spots or both, I always recommend teeth whitening for 2-4 weeks before Icon smooth surface is used. In a few cases, when the brown spots are superficial, a white polishing stone can be used to remove brown staining before initiating treatment.

Transillumination: A good way to determine if a white spot is treatable or not with Icon is to use a light curing LED. Illuminate the enamel by placing the LED tip on the palatal side of the tooth structure and see if the white spot is translucent or completely opaque. If the white spot is opaque then the treatment is less likely to be successful and may need substance removal and composite treatment.



Fig. 1: Start by applying an optragate to get the patients lips out of the way. Then take a white polishing stone and gently polish the enamel surface for a few seconds to get rid of the superficial biofilm on the enamel surface.



Fig. 2: Apply liquid rubber dam or classical endodontic rubber dam with ligatures to protect the gingiva.



Fig. 3: Blast the white spots with white aluminiumoxide. This will enable better access to the body of the lesion. Blasting of the white lesions should only be done for 2-3 seconds and only once, with the blasting tip positioned approximately 1 cm from the enamel. After completion of this stage the white lesion should give away a matte appearance.



➤ **Fig. 4:** Apply Icon-Etch over the white lesions and rub it gently for a few seconds with a dry tip until the etch loses its glide and gives away a foamy appearance. Let the Icon-Etch rest on the surface for 2 minutes and then rinse it off with water for at least 30 seconds.



➤ **Fig. 5:** After careful rinse of the tooth surface, dry with oil-free and water-free air. Then wet the white lesion with Icon-Dry. What you want to see is either a complete temporary masking/disappearance of the white lesion when wetted or a fluctuation in the white color of the lesion when wetted with Icon-Dry. This indicates that the lesion is now accessible for the Icon-Infiltrant.



➤ **Fig. 6:** When the white lesion has responded well to Icon-Dry it is time to use the Icon-Infiltrant. Take your chair attached lamp away from the patient's teeth and apply Icon-Infiltrant on a dry enamel surface. Use rich amounts. Let it then infiltrate the surface for 3 minutes. Carefully air-dry the surface followed by flossing then light cure for 40 seconds. Repeat the process a second time, but with only 1 minute infiltration time.



➤ **Fig. 7:** After the Icon-Infiltration process the enamel surface will present a matte appearance. To get a shiny and smooth surface use 3M polishing discs. Start with a light orange disc on a dry surface and carefully polish away any unevenness. Moreover, rinse the surface with water, air blast and finish the polishing process by using a yellow disc.



➤ **Fig. 8:** Final result.

Key Learnings

- Make sure to rub the Icon-Etch properly onto the enamel.
- Transillumination analysis pretreatment is a very good clinical indicator of whether you will need to remove tooth substance and use composite in addition to your treatment or if you can use Icon alone.
- For optimal aesthetics use polishing discs to polish the matte surface after the treatment.

Masking Fluorotic Lesions with Icon.

Associate Prof. Giuseppe Allocca

Fluoride is one of the most important caries-preventive agents in dentistry [1]. Nevertheless a chronic exposure of too high fluoride intake during tooth development can lead to fluorotic spots on the tooth surface. Especially high concentrations of naturally occurring fluorides in drinking water seem to be the main cause for fluorosis [2].

Histologically, fluorotic enamel is characterized by hypomineralization, resulting in porosities of the tooth (sub-) surface [1, 3]. The appearance of these spots varies from opaque whitish to unsightly brown spots or even pitting, dependent on the duration and time point of high fluoride exposure during tooth development as well as patient related factors (e.g. patient's age or individual response) [2].

The main consequence of dental fluorosis is compromised esthetics [3]. Especially when front teeth are affected by dental fluorosis dentists often are confronted with the patient's demands of esthetic improvement as the appearance of these areas can be compromising. Treatment options include bleaching in case of mild forms, moderate forms of fluorosis can be treated with enamel microabrasion. Severe cases can require composite fillings or even veneers [2, 4]. Infiltration of these fluoride spots with Icon is an alternative treatment option to mask these compromising areas on the tooth surface. In young patients dentists might want to avoid dental bleaching as well as more invasive treatments. Icon is not only minimal- but microinvasive and can also be applied on young teeth. The low viscosity resin of Icon occludes the lesion porosities. As a result the lesions are masked [3].

Clinical case report

An eight year old male patient with whitish and chalky spots on his upper front teeth applied to our dental office with his mother. He was suffering from his classmates' mocking due to the appearance of his teeth 11 and 21. In addition to that his mother raised concerns about the chalky appearance of these spots when her child gets up in the morning. After detailed examination dental fluorosis was diagnosed and it was assumed that the reduction of saliva moistening of the patient's teeth during the night promotes the chalky effect in the

morning. In order to terminate the patient's psychological strain due to compromised esthetics we suggested an Icon treatment to mask the fluorotic lesions.

Discussion

Fluorotic spots can be a burden for patients as they often compromise esthetics. The clinical treatment goal of this kind of tooth discoloration should be achieving an acceptable esthetic result as conservatively as possible. Icon enables to mask these lesions in a microinvasive way as no mechanical enamel removal is required. The surface is just eroded with the Icon-Etch to get access to the



Fig. 1: Initial situation of the fluorotic spots before treatment with Icon. Especially the appearance of the teeth 21 and 11 were esthetically compromising.

lesion. Compared to microabrasion or conventional restorative treatment options Icon is less invasive. Furthermore the treatment time is shorter compared to other treatment options which can be an advantage in children with less compliance. Though in the same way as in some bleaching and enamel microabrasion techniques it has to be considered that the treatment result is dependent on the severity of the fluorotic spots. In some cases an improvement but not a completely masking of the spots can be achieved [3].

Conclusion

Treating fluorotic spots with Icon is a microinvasive, short and painless treatment option which improves esthetics and can be applied also in young patients.

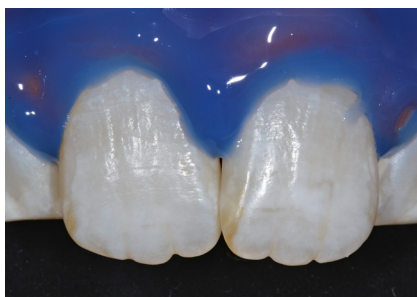


Fig. 2



Fig. 3

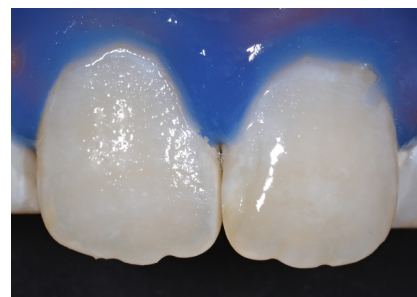


Fig. 4

Fig. 2: After polishing the teeth with pumice the resin barrier Opaldam Green (Ultradent®) was applied in order to isolate the working field and to protect the gingiva which both is mandatory when using Icon. **Fig. 3:** To condition the surface Icon-Etch was applied for 2 minutes. The etching gel was removed with water spray for 30 seconds and the surface was dried. The etching step was repeated 4 times. Especially with fluorosis it is often necessary to repeat the etching step several times to gain sufficient access to the lesion body. **Fig. 4:** In the next treatment step Icon-Dry was applied for 30 seconds. Immediately after the wetting with Icon-Dry the operator gets a preview of the masking effect. If the lesions do not diminish the etching step should be repeated. After 30 seconds the surfaces were thoroughly dried with oil free and water-free air.



Fig. 5



Fig. 6

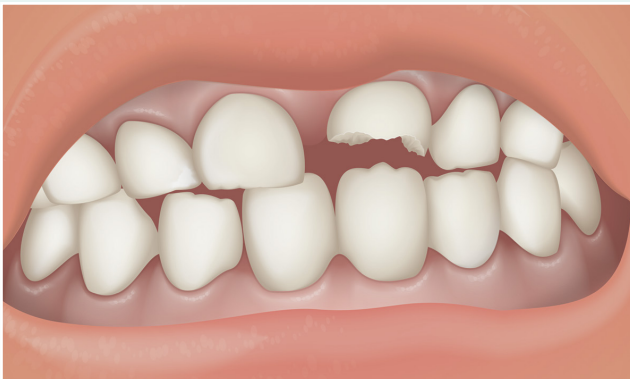
Fig. 5: Next Icon-Infiltrant was applied and it was set for 6 minutes because of severe fluorosis diagnosis. Excess material was removed with a cotton wad and dental floss before it was light cured for 40 s. This infiltrant step was repeated letting the infiltrant set again for 3 minutes before excess removal and light curing. Polishing was performed with Flairesse medium (DMG®) and Enamel Shiny Micerium polishing kit (Micerium s.r.l.). The fluorotic spots on both central front teeth are completely masked. **Fig. 6:** Clinical situation 3 months after Icon treatment. The situation is stable, the lesions on the teeth 21 and 11 are masked completely.

Key Learnings

- Especially with fluorosis it is often necessary to repeat the etching step several times to gain sufficient access to the lesion body.
- Icon-Infiltrant can be set for 6 minutes because of severe fluorosis diagnosis.
- Icon Infiltration treatment can be also used for the permanent teeth for young children.

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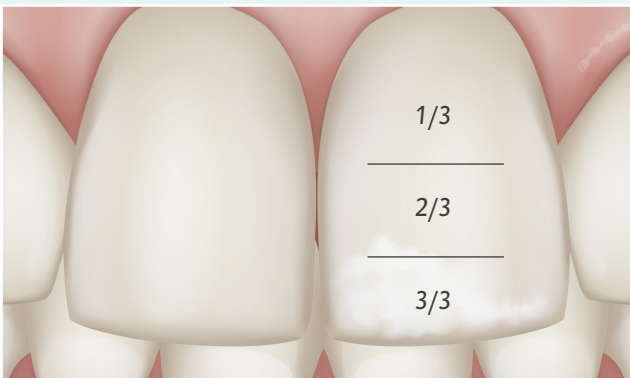
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Patient history or etiology. A trauma or apical periodontitis in the primary tooth.



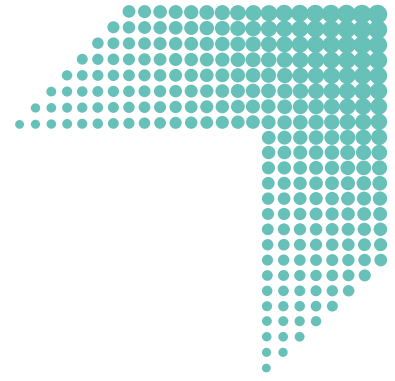
Affected tooth/teeth. Usually one or several teeth. Associated lesions can often be found on opposite jaw.



Localization. Mostly affects the facial surface (the side closer to the lips or cheek).



Border. Well-demarcated. It also could be a quantitative defect associated with reduced localized thickness of enamel (enamel hypoplasia)



Traumatic hypomineralisation

Dental history and visual diagnosis

Traumatic hypomineralization of a permanent tooth is a consequence of periodontal trauma affecting the deciduous teeth. Whatever the severity of this trauma, the appearance of sequellae is sporadic [1].

The prevalence of this hypomineralization is estimated as 5.2%. This figure is not surprising, given that one third of children suffer a traumatic episode involving their deciduous teeth before the age of 5.

The close anatomical proximity that exists between the apices of the anterior deciduous teeth and the germs of their permanent successors, which also display delayed calcification, explains this relationship.

Traumatic hypomineralization can present a wide variety of clinical expressions differing in shape, outline, localization and even color. They are generally punctiform lesions situated on the incisal half of tooth crowns. They are often limited to one

tooth, and asymmetrical with respect to the corresponding contralateral teeth. However, associated lesions can often be found on mandibular opponents.

The histopathology of traumatic hypomineralization is similar to that of WS and fluorosis. It involves also subsurface hypomineralization under a relatively well-mineralized surface layer.

Either superficial or deep erosion-infiltration works very well to treat traumatic hypomineralisation. [2].

Dr. Jean-Pierre Attal

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Treatment of traumatic hypomineralized teeth.

Dr. Jean-Pierre Attal

Traumatic hypomineralization of a permanent tooth is a consequence of periodontal trauma affecting the deciduous teeth. Whatever the severity of this trauma, the appearance of sequelae is sporadic [1].

The prevalence of this hypomineralization is estimated as 5.2%. This figure is not surprising, given that one third of children suffer a traumatic episode involving their deciduous teeth before the age of 5.

The close anatomical proximity between the apices of the anterior deciduous teeth and the germs of their permanent successors could explain why the trauma can lead to the delayed calcification of the affected permanent tooth germs.

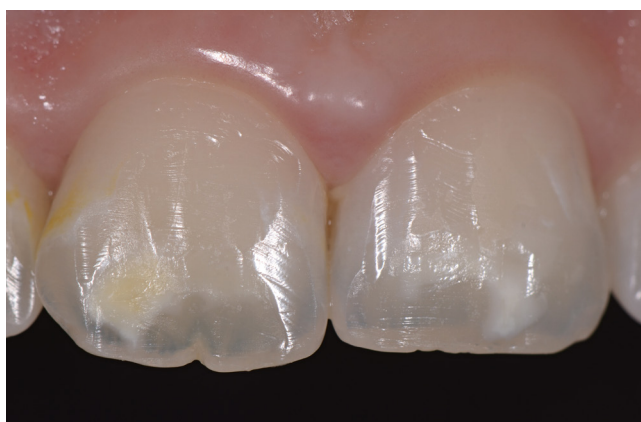
Traumatic hypomineralization can present a wide variety of clinical expressions differing in shape, outline, localization and even color. They are generally punctiform lesions situated on the incisal half of tooth crowns. They are often limited to one tooth and asymmetrical. However, associated lesions can often be found on opposite jaw.

The histopathology of traumatic hypomineralization is similar to that of white spots and fluorosis. It involves subsurface hypomineralization under a relatively well-mineralized surface layer.

The erosion/infiltration treatment works very well, either superficial or deep infiltration [2].

Clinical case report

A 25 years old lady would like to mask the two lesions on the central incisors. The diagnosis is almost easy: MIH was excluded because there are no lesions on first molars; fluorosis and incipient caries are also excluded according to clinical expressions. In the end traumatic hypomineralization was diagnosed. One hour treatment is planned to treat the two lesions.



➤ **Fig. 1:** Initial situation with two lesions due to trauma on teeth 11 and 21 (white lesion on 21 and slightly yellow on 11). The third incisal portion of teeth is concerned with a high translucency of the edge. As the lesion appears relatively deep, we know that we need to infiltrate in depth. So we eliminate a very thin layer of enamel with the bur.



➤ **Fig. 2:** First application of Icon-Etch.



➤ **Fig. 3:** After rinsing, drying and application of Icon-Dry, we note a slight masking of the lesions. But not enough to infiltrate.



➤ **Fig. 4:** Second application of Icon-Etch



➤ **Fig. 5:** After rinsing and drying.



➤ **Fig. 6:** Icon-Dry allows a partial masking of the lesion. That shows that ethanol can infiltrate the porous lesion. We know that Icon-Infiltrant could infiltrate too.



➤ **Fig. 7:** After infiltration with Icon-Infiltrant and light curing. The masking is efficient.



➤ **Fig. 8:** A small amount of enamel composite is sufficient to compensate the very small loss of substance of enamel due to the combination of bur and acid erosion. The lesions are not visible anymore.

Key Learnings

- For deep traumatic hypomineralization, you have almost always to do a deep infiltration. So you need to sandblast or to drill.
- Never infiltrate the lesion unless you have a clear modification with Icon-Dry after the rinsing of Icon-Etch.

References

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Non-Invasive treatment of enamel hypomineralizations with Icon.

Prof. Dr. Zafer Cehreli

In daily practice, developmental enamel defects are being more frequently seen in young patients. The management of such enamel lesions depends on the type and severity of defect, and minor lesions are often treated by bleaching, microabrasion or conservative resin-based restorations. Resin infiltration was originally developed for the non-invasive treatment of initial proximal carious lesions and post-orthodontic white spot lesions, but its esthetic masking effect by taking on the appearance of the surrounding enamel has introduced new possibilities for the non-invasive esthetic management of a variety of developmental enamel defects including enamel hypomineralizations. This is of particular importance, because hypomineralized enamel is resistant to conventional acid etching, which may lead to poor micromechanical adhesion and subsequent microleakage when such lesions need to be treated with resin-based composites. On the other hand, microabrasion may lead to some tissue loss at the surface layer, which often needs to be restored with composite resin.

Icon can mask small, white developmental defects by infiltrating into the pores with a resin that has a refractive index close to that of the surrounding sound enamel. The masking effect is immediate, and in most cases dramatic. Esthetic improvements are even observed in teeth with incomplete resin penetration. The Icon system utilizes 15 % hydrochloric acid to open the pores within the lesions, thereby facilitating penetration of the resin infiltrant. Even after repeated applications of hydrochloric acid, the enamel removed from the surface is almost negligible, resulting in a truly non-invasive, ultraconservative esthetic treatment.

The following case is a typical example of small, shallow hypomineralization lesions. The patient seeks esthetics, while the parents demand a non-restorative solution.

➤ **Fig. 1:** A 9-Year-old girl with hypomineralization lesions on central and lateral incisors. The patient is more concerned with the lesions on central incisors. The parents do not prefer restorative treatment.

➤ **Fig. 2:** View of the lesions under cross-polarization filter, which eliminates highlights that mask the opacities, and thus provide a better appreciation of the borders of the lesions.

➤ **Fig. 3:** Isolation of affected teeth after cleaning of surfaces with fluoride free pumice and rotary rubber cup at slow speed. Before placement of the rubber dam, the gingiva should be isolated with Vaseline to ensure protection. The borders of the lesions can be better appreciated after dehydration. Tooth no 11 has well defined borders, while 21 has diffuse hypomineralizations. The lesion on 11 appears to be a deeper than its neighbor, suggesting that additional etching may be necessary. ➤ **Fig. 4:** The hydrochloric acid gel is applied on the lesions and allowed to sit for 2 minutes. ➤ **Fig. 5:** All tooth surfaces should be thoroughly washed with air-water spray for at least 30s and the teeth should be dried meticulously with oil-free compressed air. ➤ **Fig. 6:** Icon-Dry is absolute ethanol, and is applied to dry the pores within the lesions. Icon-Dry has a second important function of providing a preview image of the final appearance after infiltration. To achieve best results, the ethanol should stay on tooth surfaces for at least 30 seconds. Here the lesion on tooth 21 appears to be masked satisfactorily, while the lesion on 11 suggests that an additional etching step will be necessary.

➤ **Fig. 7:** This time, the Icon-Etch is applied only on tooth 11 for 2 minutes.

➤ **Fig. 8:** Again, the tooth is rinsed for at least 30 seconds with air-water spray.

➤ **Fig. 9:** Dry with oil-free and water-free air. There is no visible change. However, a decision can only be made after the application of Icon-Dry.



➤ Fig. 1



➤ Fig. 2



➤ Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9



Fig. 10



Fig. 11

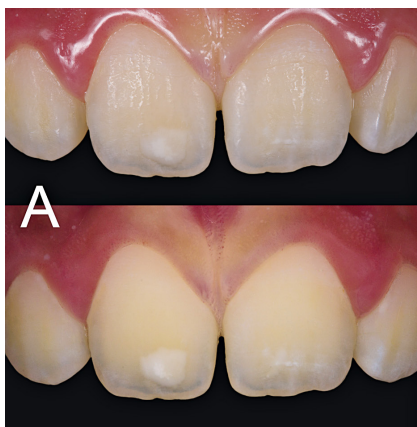
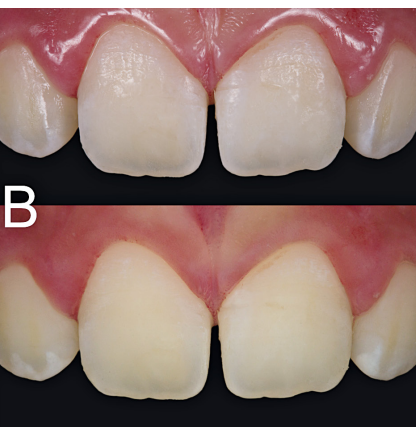


Fig. 12



Following a 30-second application of absolute ethanol, the lesion on tooth 11 appears to be masked well. A comparison of the first (A) and second (B) rounds of Icon-Dry applications. For each step, the upper photo shows the dried lesion and the lower one shows the dramatic masking effect created by absolute ethanol. After two rounds of etching and drying, it is evident that an additional etching step will not be required.

Fig. 10: Application of the Icon-Infiltrant. An ample amount of Icon-Infiltrant should be introduced onto the lesion site and should sit for 3 minutes with the operatory light turned off.

Excess resin should be removed from the surface with gauze and the teeth should be exposed to curing light for 40 seconds each. Then the Icon-Infiltrant should be applied

as a second layer for at least 1 minute and subsequently light-cured as with the first layer. It is always beneficial to perform a final round of light curing with the tooth surfaces covered with glycerine gel to prevent oxygen inhibited surface layer.

Fig. 11: Excess resin should be gently removed using slow speed disks or rubber cups, leaving a polished enamel surface.

Fig. 12: Immediate post-operative view showing the total masking effect.

Under cross polarization, the borders of the lesions are invisible and there is excellent color match. In this patient, the esthetics was reestablished without the need to treat the laterals. A comparison of preoperative (A) and post-operative images (B) showing the masking effect achieved with a non-invasive treatment approach. For each image set, the upper photo shows the actual result, and the lower one shows the lesion under cross-polarization filter.